APPLICATION

FOR

UNITED STATES OF AMERICA

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SPECIFICATION

TO ALL WHOM IT MAY CONCERN:

Be it known that I,

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have invented certain improvements in

"MECHANICAL DEVICE PARTICULARLY FOR MOVING THE SEAT AND BACKREST OF A CHAIR"

of which the following description in connection with the accompanying drawings is a specification, like reference characters on the drawings indicating like parts in the several figures.

BACKGROUND OF THE INVENTION

The present invention relates to a mechanical device, particularly suitable for the movement of a chair.

Mechanical devices of a known type are currently in use which are commonly known as rocker plates and comprise a first plate that is associable under the lower surface of the chair.

Said first plate has two first shoulders that protrude laterally and downward, so as to form an interspace for accommodating a second plate that is smaller and approximately U-shaped, so as to form two second shoulders.

In particular, the second plate is pivoted to the first plate by way of a pivot that is arranged transversely approximately at the centerline of the first and second shoulders, which act as means for limiting the stroke of the mutual oscillation between the first and second plates.

Oscillation compensating means are associated with the second plate in a forward position and comprise a pair of shells between which a spring is accommodated; said spring can be preloaded during a backward oscillation of the chair.

The compensation means further comprise a tension element, arranged coaxially to the spring, for connection to the first plate.

In particular, the traction element has a head that can be arranged in abutment against the upper surface of the first plate and with which a stem is associated; said stem passes through suitable first holes formed in the first and second plates, so as to associate with a nut that is accommodated in a knob arranged on the outside of the lower half-shell.

The stem and the nut are threaded, so that a rotation of the knob produces a translational motion of the nut along the stem of the tension element and therefore a compression of the spring between the two shells.

To the rear of the compensating means, a third plate is further associated

with the second plate; the third plate is also approximately U-shaped and is provided with two third shoulders for contact against the lower surface of the second plate.

The second and third plates respectively have a second hole and a third hole, formed along the same axis, which constitute a seat for accommodating the upper end of a central column for supporting the chair.

The central column of the mechanical device of a known type accommodates a gas-filled cylinder, whose stroke is controlled by activating an upper button.

Such button can be activated selectively by the user by way of the rotation that can be imparted to a rod that is pivoted transversely and approximately horizontally to the mechanical device.

In particular, the rod is arranged so as to pass through two fourth holes, which are formed transversely in the second shoulders and through a slot and a fifth hole, both provided in the first shoulders.

In this manner, an axial movement of the rod entails the disengagement or, alternately, the engagement of its free end in the fifth hole, allowing or not the free oscillation of the first plate and of the chair with respect to the second plate and the central column.

The main drawback of this mechanical device of a known type is that the first shoulders, which are designed to protect against accidental insertion of fingers in the mechanism, often do not offer complete safety for the user during the oscillation of the chair.

Another disadvantage is that in order to provide mechanical devices of the known type it is necessary, so as to ensure good mechanical strength, to use plates of particularly high thickness, for example 3 millimeters or more.

This entails a considerable use of material, usually steel, with consequent considerable expenses and a high overall weight of the invention.

Another drawback of known types is that the mechanical device is particularly complicated to manufacture, since it usually requires welding

between said second and third plates.

Another important drawback is that the tension element must be inserted in the first holes manually, before assembling the compensating means: this entails a further cost increase and considerably greater constructive complexity.

SUMMARY OF THE INVENTION

The aim of the present invention is to solve the above-mentioned problems, eliminating the drawbacks of the cited known art, by providing a mechanical device that allows to rock the chair in maximum safety, avoiding the danger of injury to fingers due to accidental jamming in the mechanism of said device.

Within this aim, an object of the invention is to provide a device that allows to reduce manufacturing costs, preferably by way of a reduction of the number of components and of the amount of material employed, and by way of an improvement of the efficiency of the manufacturing process.

In particular, an object of the present invention is to be very strong and at the same time light, mainly due to an overall weight reduction and to the use of reduced thicknesses of material.

Another important object is to provide a device that allows rapid and effective assembly of the compensation means, which can optionally be performed after the assembly of the device.

Another object is to facilitate and simplify the activation of the device on the part of the user by way of an optimum placement of the actuation rod.

Another object is to provide a device that is structurally simple and can be manufactured with machines of a known type.

This aim and these and other objects that will become better apparent hereinafter are achieved by a mechanical device, characterized in that it comprises a single plate that is associable under a chair and with which an actuation rod can be associated transversely for the combined rotation and translational motion of an intermediate element that is pivoted inside a box-

like body that is partially accommodated at a first seat formed below said single plate, said box-like body being associable with a central column and interacting with oscillation compensation means that interact with said single plate.

BRIEF DESCRIPTION OF THE DRAWINGS

Further characteristics and advantages of the invention will become better apparent from the following detailed description of a particular but not exclusive embodiment thereof, illustrated by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is an exploded perspective view of the mechanical device according to the present invention;

Figure 2 is a bottom perspective view of the single plate;

Figure 3 is a transverse sectional view of the single plate, taken along a broken line;

Figures 4 and 5 are bottom views of the device with the rod in two different positions;

Figures 6 to 8 are various views of the device with the rod arranged in the position for blocking oscillation;

Figures 9 to 11 are various views of the device with the rod arranged in the free oscillation position;

Figures 12 and 13 are partially sectional side views of the device illustrating two steps of the insertion of the compensation means;

Figures 14 and 15 are top views of the device without the single plate and with the rod arranged in two different positions;

Figure 16 is an exploded view of the device provided with additional means for locking the plate by interference;

Figures 17 and 18 are views, similar to Figures 14 and 15, showing said additional means during activation for locking the plate by interference.

In the embodiments that follow, individual characteristics, given in relation to specific examples, may actually be interchanged with other

different characteristics that exist in other embodiments.

Moreover, it is noted that anything found to be already known during the patenting process is understood not to be claimed and to be the subject of a disclaimer.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to the figures, the reference numeral 1 designates a mechanical device that is particularly suitable for the movement of a chair.

The mechanical device 1 comprises a single plate 2, which is approximately rectangular and is associable under the chair, for example by means of a plurality of screws, not shown, which pass within respective slots, generally designated by the reference numeral 3 and formed at the corners of the plate 2.

An approximately oval ridge 4 protrudes downward at the perimeter region of the single plate 2, and its transverse cross-section is essentially triangular with rounded corners.

The ridge 4 forms, approximately centrally and below the plate 2, a first seat 5 for partially accommodating a box-like body 6 that is associable with a central column 7, shown partially in Figure 1, for supporting the chair.

In particular, the box-like body 6 has a base 8, which is approximately flat and oval and from which a hollow and substantially cylindrical stem 9 protrudes downward and in an off-center position; such stem can be accommodated in a complementarily shaped cavity 10, which is formed axially at the upper end of the central column 7.

A lateral edge, designated by the reference numeral 11, protrudes vertically and perimetrically to the base 8 of the box-like body 6, and two mutually facing first holes 12a and 12b are formed transversely to said edge.

The pair of first holes 12a and 12b is preferably formed in the lateral edge 11 along an axis that is approximately perpendicular to the axis of the stem 9 and to the longitudinal central axis of the box-like body 6, so as to allow to position two respective bushes 13a and 13b for supporting a transverse pivot

14.

Said pivot is arranged approximately at a central axis that lies transversely to the box-like body 6.

The transverse pivot 14 has free ends, designated by the reference numerals 14a and 14b, which protrude outside the bushes 13a and 13b and are accommodated in respective pairs of second holes, generally designated by the reference numerals 15a and 15b, which are formed in the ridge 4 of the single plate 2 along the same axis as the pivot 14.

In this manner, the single plate 2 is pivoted to the box-like body 6 about an axis that passes through the pivot 14.

As shown in Figures 6 and 9, the shape of the upper perimetric edge of the lateral edges 11 of the box-like body 6 is preferably shaped, when viewed from the side, slightly like an inverted V with the vertex located approximately above the pivot 14, so as to form first and second flat portions 11a and 11b for limiting the stroke of the oscillation of the plate 2 with respect to the box-like body 6.

In this manner, it is possible to define a first position, which is not rotated (Figures 6 to 8) and in which the plate 2 rests on the first flat stroke limiting portions 11a, and a second rotated position (Figures 9 to 11), in which the plate 2 rests on the second flat stroke limiting portions 11b.

A rod, designated by the reference numeral 16, is further associable transversely with the plate 2 and with the box-like body 6 and comprises first and second portions 16a and 16b that are approximately straight and lie on the same axis and are mutually connected by a third portion 16c that is approximately C-shaped and is accommodated inside the box-like body 6.

The first portion 16a, which is short, and the second portion 16b, which is longer, can pass through a pair of third holes, respectively designated by the reference numerals 17a and 17b, which are formed in the box-like body 6 along an axis that is substantially parallel to the axis of the pivot 14 and is provided in the opposite direction with respect to the stem 9.

Moreover, the second portion 16b protrudes outside the mechanical device 1 through a first recess or flattened portion 18, which is provided in the ridge 4 of the plate 2, and is connected, at its outer end, to a fourth portion 16d, which is oblique and in turn is connected to a knob 19.

As shown in Figures 4 and 5, the rod 16 can perform an axial translational motion of a preset length between two end positions, one in which the first portion 16a is almost entirely accommodated in the box-like body 6 (Figure 4) and another in which the first portion 16a is arranged within a second recess or flattened portion 20, which is formed in the ridge 4 opposite the first flattened portion 18 and is shallower than said first portion.

In this manner, the position of the rod 16 determines the degrees of freedom of the single plate 2 with respect to the box-like body 6; when the first portion 16a is accommodated in the box-like body 6, the plate 2 can rotate freely counterclockwise, from the first position of Figure 6 to the second position of Figure 9.

Vice versa, starting from the first position of Figure 6 and arranging the first portion 16a of the rod 16 within the second flattened portion 20, the plate 2 is locked by means of the interference of the first portion 16a with the ridge 4 of the plate 2.

The first portion 16a of the rod 16 and the flattened portion 20 form means suitable to lock the plate by interference with respect to the box-like body.

The rod 16 further allows to actuate the axial translational motion and partial rotation of an intermediate element 21, which is pivoted inside the box-like body 6.

The intermediate element 21 has, in plan view, an approximately triangular shape, which forms a base side 21a, which is arranged at the pivot 14 parallel to the axis thereof, and a vertex 21b, which is arranged opposite the base side 21a and is directed toward the C-shaped third portion 16c of the rod 16.

In particular, proximate and parallel to the base side 21a there is, in the intermediate element 21, a fourth through hole 22 for the passage of the transverse pivot 14, so as to provide the pivoting of the intermediate element 21.

Proximate to the vertex 21b there is a transverse slot 23, which is formed approximately parallel to the pivot 14, for partially accommodating rotatably the third portion 16c.

In this manner, a rotation of the rod 16 about the axis of the first and second portions 16a and 16b produces a rotation of the intermediate element 21 about the pivot 14.

In particular, when the knob 19 is lifted, the third portion 16c and the vertex 21b are rotated downward, so as to force a contact between a preset lower protrusion 21c of the intermediate element 21 and a button 24 that protrudes at the top of a gas-filled cylinder of a known type, designated by the reference numeral 25, which is accommodated in the central column 7.

The button 24 constitutes the means for activating the gas-filled cylinder 25, accordingly allowing the user to vary the distance of the chair from the ground.

Oscillation compensation means, designated by the reference numeral 26, interacting with the single plate 2 for compensating the oscillation thereof, protrude below the box-like body 6 approximately opposite the stem 9 of the box-like body 6 with respect to an axis that approximately coincides with the axis of the pivot 14.

The compensation means 26 comprise a first half-shell and a second half-shell, designated by the reference numerals 27 and 28, which are mutually associable so as to form an enclosure that has a substantially ovoid shape.

The first half-shell 27, which is arranged, upon mounting in a lower position with respect to the second, upper half-shell 28 and has a larger diameter, is provided with a fifth axial through hole 29, which is connected to a second seat 30 that is external and wider and is designed to

accommodate a complementarily shaped nut 31 that is threaded internally.

The complementarily threaded end, designated by the reference numeral 32a, of a tension element 32 is associable with the nut 31; said tension element is partially accommodated in the first half-shell 27 and the second half-shell 28 and protrudes therefrom through a sixth upper hole 33.

The tension element 32 has a head 32b that is approximately T-shaped and protrudes above the sixth hole 33; the head 32b can be made to pass, during assembly, through a first slot 34 that is formed in the base 8 of the box-like body 6, approximately opposite the position of the stem 9, and is obtained along the longitudinal central axis of the body 6.

The head 32b can further pass through a second slot 35, which is approximately similar to the preceding one and is formed, along the same axis, within the single plate 2.

A third seat 36 for accommodating the head 32b is provided beforehand on the upper surface of the plate 2, transversely to the second slot 35, in order to provide a nonrotating bayonet-like coupling of the tension element 32 to the plate 2.

In this manner, the tension element 32 also acts as an element for interconnecting the compensation means 26 and the plate 2.

The tension element 32, by interacting with the first half-shell 27 and with the nut 31, also allows to adjust the compression of an elastically deformable element, such as a helical spring 37, which is conveniently accommodated between a first annular pad 38a and a second annular pad 38b, which are in turn respectively accommodated in the first and second half-shells 27 and 28.

A rotation of the first half-shell 27 in fact entails an axial translational motion of the nut 31 along the complementarily threaded end 32a of the tension element 32, so as to move the first pad 38a toward the second pad 38b and thus increase or decrease the compression of the spring 37.

During the use of the chair, the activation of the spring 37 is achieved as

a consequence of the oscillation of the plate 2 with respect to the box-like body 6: in particular, it is preloaded during the backward rotation of the chair imparted by the user (counterclockwise until the position of Figure 9 is reached).

Then, once the force that produced the backward oscillation is no longer applied, the spring 37 imposes a clockwise rotation, actuating the return to the original position of Figure 6.

A rotation of the first half-shell 27 with respect to the tension element 32 entails a variation of the compression of the spring 37 and therefore a variation of the behavior of the compensation means 26 in controlling the oscillation of the plate 2 with respect to the box-like body 6.

The second slot 35 can be obtained advantageously by cutting the plate 2 and subsequently subjecting it to localized deformation, so as to obtain a bridge 39 that constitutes a stroke limiting element for the tension element 32.

If the first half-shell 27 is compressed toward the second half-shell 28, contact in fact occurs between the head 32b of the tension element 32 and the bridge 39, thus avoiding damage of the lower surface, not shown, of the chair.

The single plate 2 and the box-like body 6 can be obtained by means of a pressing operation starting from a single metal sheet: the type of process and most of all the particular chosen configuration, which is extremely compact and substantially free from weak regions, allow to provide the invention starting from metal plates of limited thickness, for example on the order of 2-2.5 millimeters, with consequent considerable financial advantages.

Operation is therefore as follows: with reference to the figures, the user can actuate the rod by imparting a translational motion thereto, so as to produce the selective and temporary interconnection of the first portion 16a with the second flattened portion 20, allowing or not the oscillation of the chair.

Moreover, the user can act on the knob 19 of the rod 16, lifting it and thus entailing a rotation of said rod.

This produces the activation, by the third portion 16c, of the button 24 of the gas-filled cylinder 25, with the consequent possibility to adjust the height of the chair from the ground.

The operation for activating the gas-filled cylinder is facilitated by the fact that the knob 19 protrudes in front of the rod 16, and therefore laterally to the user, and so can be accessed easily.

This is due to the fact that differently from the background art, the third portion 16c is directed, with respect to the axis that passes through the first and second portions, away from the fourth portion 16d for connection to the knob.

It has thus been found that the invention has achieved the intended aim and objects, a mechanical device having been provided which allows to adjust the chair easily and in maximum safety.

This is due mainly to the fact that the shape of the invention is such as to comprise a single plate that accommodates, in each step of the oscillation, the upper edges of the box-like body.

Moreover, the interspace between the box-like body and the respective seat is very small and in any case not sufficient to allow the accidental insertion or jamming of the fingers of the user inside the mechanism.

The invention can be worked by pressing, and in this manner no operations for mutually welding the components are necessary.

Moreover, the reduction in the number of components and the simplification of the operations for assembling them, such as for example the bayonet-like insertion of the T-shaped tension element, entail faster assembly and an optimization of production steps and of the organization of inventory reserves.

These technical solutions and others entail a considerable reduction of manufacturing costs, while keeping at least unchanged the strength of the

mechanical device.

At the same time, the invention has the advantage of having a reduced weight, mainly due to the use of reduced thicknesses of material and to the improvement of the efficiency of the components used.

The invention is of course susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

The materials used, as well as the dimensions that constitute the individual components of the invention, may of course be more pertinent according to specific requirements.

The various means for performing the different functions mentioned and defined by the claims need not certainly coexist or be present only in the illustrated embodiment but can be used, per se, in different embodiments of chair mechanisms other than those illustrated.

Figures 16, 17 and 18 illustrate additional means that are suitable to lock the plate 2 by interference; said locking means are constituted by a lever or latch 40, which is substantially L-shaped so as to form a first wing 41 and a second wing 42, arranged on the same plane and provided, in the connecting region, with a locking pivot 44 obtained during pressing, which protrudes at least below the latch 40 for pivoting said lever to the box-like body 6.

The locking pivot 44 is in fact accommodated at a suitable seat 45, formed on the base 8 of the box-like body 6 in a region that is adjacent to the third hole 17b, on the opposite side with respect to the first slot 34.

The free end of the first wing 41, which when inactive lies approximately transversely to the box-like body 6, has a tooth 46 that is directed, in the condition in which the interference locking means are not activated, along an axis that is approximately longitudinal to the box-like body.

A protrusion 47 projects at the free end of the second wing 42 along a plane that is perpendicular to said wing, and can be arranged at a suitable eighth hole 48 formed at the overlying intermediate element 21.

The tooth 46 instead faces the adjacent lateral edge 11 of the box-like

body 6; at said tooth there is, on said lateral edge, a milling 49 that is suitable to allow the free sliding therein of the tooth 46 until it protrudes outside the lateral edge 11.

As shown in Figures 17 and 18, a movement of the rod 16 that places the first portion 16a of said rod inside the second flattened portion 20 is also matched by a rotation imparted to the lever 40, by way of the interference of the protrusion 47 with the eighth hole 48 formed in the intermediate element 21.

In this manner, the tooth 46 protrudes beyond the milling 49 and engages at a suitable locator formed at the single plate 2, thus further locking its movement.

The disclosures in Italian Patent Application No. TV2003A000021 from which this application claims priority are incorporated herein by reference.